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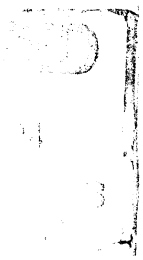

Trade Policy Reform with Market Intermediaries:

The Case of the European Community Banana Regime

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Abstract

Studies of trade policy reform typically ignore the existence of market intermediaries in the food system who may behave imperfectly competitively. This paper outlines a model for dealing with such features, which is used to evaluate welfare changes in the UK following reform of the European Community banana regime in 1993.

Introduction

Most applied policy analysis in agricultural economics typically ignores the existence of market intermediaries that transform and distribute output from the farm sector before it reaches final consumers. However, casual observation suggests that such intermediaries, including marketing boards, food processors, transportation services, wholesalers and retailers, play an important role in a vertically interrelated marketing system. If such intermediaries were characterized by perfectly competitive behavior, ignoring them would not significantly affect analysis of trade policy reform, which, with few exceptions, typically ignores market structure issues. However, there is increasing awareness that the existence of these intermediaries complicates policy analysis, and there is plenty of evidence in the literature to suggest that such intermediaries often behave less than competitively (see, for example, Sutton).

The aim of this paper, therefore, is to consider how the existence of such intermediaries affects the outcome of trade policy analysis. A model of a multi-stage food system is outlined, allowing for the existence of imperfect competition at each stage of the system, except for the agricultural sector. This analysis is then applied to recent reforms of the European Community's (EC) banana regime which has resulted in harmonized external protection for the EC countries with respect to banana imports from favored and non-favored countries. Emphasizing changes in consumer surplus, the analysis shows that ignoring market structure can exaggerate expected changes in consumer welfare, i.e. with imperfect competition, the marginal effects on consumer welfare that occur with trade policy reform are lower when markets are oligopolistic relative to the case where perfect competition is assumed.

The paper is organized as follows: Section 1 reviews recent changes in the EC banana regime and outlines the features of this market, which sets the context for the remainder of the

paper. Section 2 outlines a model for dealing with the principal characteristics of this market, in particular emphasizing oligopolistic behavior at intermediate stages of the vertical marketing chain. Section 3 reports the results of a simulation exercise for the EC banana market reforms based on calibration of the theoretical model, and Section 4 summarizes and concludes.

1. Changes in the EC Banana Market Regime

In the past year, there has been considerable discussion of the EC's banana import regime. Under the Lomé Convention, the EC is formally obliged to ensure access to certain EC markets for banana exports from African, Caribbean and Pacific (ACP) countries and, in doing so, ensure remunerative returns. Thus, the EC banana market has been highly segmented with the ACP countries having preferential access to the UK, French and Spanish markets. Banana exports from non-ACP countries (so-called "dollar" countries), have had limited access to these markets due to the use of quota restrictions. In contrast, other EC countries have operated different policies towards banana imports. These countries have largely imported from "dollar" countries and have operated an array of policies ranging from tariffs in the Netherlands and Belgium to a completely free market regime in Germany.

The overall effect of these policies has been to generate cross-country differences in the retail price of bananas (Fitzpatrick and Associates, 1990). Clearly with the advent of 1993, the persistence of different trade barriers and market segmentation in the EC would have been inconsistent with the aims of the European Single Market. Consequently, throughout much of 1992, proposals were discussed with the aim of reforming the EC banana regime in a manner consistent with unrestricted trade within the EC, but at the same time maintaining remunerative returns to ACP banana suppliers. On 17th December, 1992, following much debate, the issue was

finally resolved: a tariff-quota scheme covering all banana imports into the EC was to be introduced in 1993 with the basic tariff level being 20 percent for the first two million tonnes of bananas with prohibitive tariffs on imports above this level (around 170 percent).

In the course of these discussions, there has been considerable economic analysis of this issue, the most notable papers being by Borrell and Yang (1990, 1992), and Borrell and Cuthbertson. These papers have used non-spatial models of the EC banana market to derive expected welfare changes given various EC import policy scenarios. In particular, the focus in these studies has been on banana exporting countries rather than production in a vertically-related distribution and retailing system involving private firms. In addition, these studies have assumed that the EC banana market is perfectly competitive.

However, neither assumption fits the facts. First, the sale of bananas is conducted through a complex, international, vertical marketing system, consisting of: plantation production (i.e. in Jamaica, Colombia and Ecuador); the wrapping and boxing of hands of green bananas; transportation via high-speed refrigerator vessels; large-scale ripening in the importing country; wholesale distribution and sale to final consumers through supermarket outlets. Second, various stages of this vertical marketing system can be characterized as imperfectly competitive. The key feature of the world banana export industry is the dominance of three multinational firms, United Brands (Chiquita), Standard Fruit (Dole), and Del Monte (see Read). Between them, these three firms account for 70 percent of the world market and 66 percent of the European market, United Brands alone accounting for 43 percent (Hallam and McCorriston). In addition, product differentiation through branding is a key feature of the retailing of bananas. For example, United Brands are reported to be able to sell their Chiquita brand at a price on average between 30 to

40 percent higher than its unbranded bananas (European Commission). Further evidence of market power in the EC is given by the European Commission's 1976 ruling against United Brands that it abused its dominant market position, and the commencement of a second inquiry into the firm's activities in 1990.

2. A Model of Vertically-Related Markets

In this section a stylized model of a vertical marketing system is outlined. The model is kept as simple as possible in order to keep the derivations tractable and the results transparent. Consider the case of an agricultural sector a (i.e. banana production), along with a two-stage processing/marketing system, $v = 1,2$, comprised of a first stage $v = 1$, where firms convert a raw agricultural commodity which is then sold on to a second stage $v = 2$, further value being added at each stage of the system. Agricultural commodity prices are assumed to be either determined competitively or by government fiat, while stages $v = 1,2$ are characterized by duopolistic market structures, the first stage selling a processed, homogeneous food input (i.e. boxed and refrigerated bananas) to the second stage which then sells consumers differentiated products (ripened and branded bananas). Note that if the input processed by stage two, is imported it may also be affected by border measures such as tariffs.

In order to describe the structure of demand at the second stage, a differentiated duopoly, similar to that adopted by Cheng, Dixit (1979, 1988), and Singh and Vives, is used. In common with previous work on the farm-retail price spread (Heien; Kinuccan and Forker), the second stage firms, $i = 1,2$ are assumed to combine output purchased from the first stage with other inputs in a fixed proportions, constant costs technology - a reasonable assumption for describing the sale of branded bananas. The output relationship can be written in the following form,

originally suggested by Greenhut and Ohta:

(1) $$q_{2i} = \phi_i q_{1i} \qquad i = 1,2$$

where q_{1i} and q_{2i} are outputs at the first and second stages respectively, and ϕ_i is the constant coefficient of production, representing the share of q_{1i} used in production at the second stage. In addition, it is assumed that first-stage firms exercise no monopsony power with respect to the agricultural sector, and second-stage firms take the price of first-stage output as given, i.e. there is arms' length pricing.

In terms of consumer demand, other sectors of the economy can be regarded as a competitive *numeraire* so that the consumer's utility function is linear and separable in the *numeraire*. Thus income effects can be ignored and partial equilibrium analysis can be conducted. The representative consumer maximizes:

(2) $$U(q_{2i}) - \sum_{i=1}^{2} p_{2i} q_{2i} \qquad i = 1,2$$

where q_{2i} and p_{2i} are the amount and price of each product respectively at the second stage, and $U(q_{2i})$ is given by:

(3) $$U(q_{2i}) = a_i q_{2i} + a_j q_{2j} - (b_i q_{2i}^2 + b_j q_{2j}^2 + 2k q_{2i} q_{2j})/2 \qquad i \neq j$$

where (3) is quadratic and concave, and the parameters a_i and b_i are assumed positive. Maximizing expression (2) generates the inverse demand function for product i at stage two:

(4) $$p_{2i} = a_i - b_i q_{2i} - k q_{2j} \qquad i \neq j$$

where $b_i b_j - k^2 > 0$ if the products are imperfect substitutes, $b_i b_j - k^2 = 0$ if they are perfectly substitutable and $k = 0$ if they are independent.

In order to keep the analysis simple, two aspects of the framework are examined. First, although the model can be generalized to a general, n-firm conjectural variations setting, the

focus here is on the case of duopoly at stages one and two, where the firms have Cournot conjectures. This assumption is sufficient to deduce some general propositions about trade policy reform and market intermediaries. Second, only the price-transmission effects through this vertically-linked food system are considered.

(a) Cournot Equilibrium

In a Cournot game, each firm chooses output in order to maximize profits, given the output choice of its rival. Focusing on the second stage of the chain, $v = 2$, firm i's profits are:

$$\pi_{2i} = q_{2i}(a_i - b_i q_{2i} - k q_{2j}) - p_{1i} q_{2i} - c_{2i} q_{2i} \qquad i \neq j \tag{5}$$

where p_{1i} is the price that firms at stage one charge for the semi-processed product, and c_{2i} are other stage-two costs. Profit maximization implies:

$$\frac{d\pi_{2i}}{dq_{2i}} = a_i - 2b_i q_{2i} - k q_{2j} - p_{1i} - c_{2i} = 0 \qquad i \neq j \tag{6}$$

Assuming the usual conditions for a Nash equilibrium are satisfied (see Tirole), an explicit expression for Cournot prices is given as:

$$p_{2i}^{C} = a_i - \frac{(2b_i b_j - k^2)(a_i - p_{1i} - c_{2i}) - b_i k(a_j - p_{1j} - c_{2j})}{4b_i b_j - k^2} \qquad i \neq j \tag{7}$$

where superscript C refers to Cournot strategies.

Turning to the first stage of the chain, $v = 1$, the inverse derived demand function is defined by re-arranging (6), and recognizing that $q_{2i} = \phi_i q_{1i}$:

$$p_{1i} = a_i - 2b_i \phi_i q_{1i} - k \phi_i q_{1j} - c_{2i} \qquad i \neq j \tag{8}$$

Solving out for the explicit Cournot equilibrium prices at stage one:

$$p_{1i}^{C} = \Lambda_i - \frac{(8b_i b_j - k^2)(\Lambda_i - C_{1i}) - 2b_i k(\Lambda_j - C_{1j})}{16b_i b_j - k^2} \qquad i \neq j \tag{9}$$

where $\Lambda_i = (a_i - c_{2i})$, $\Lambda_j = (a_j - c_{2j})$, $C_i = (p_{ai} + c_{1i})$, $C_j = (p_{aj} + c_{1j})$, p_{ai} is the price firms at stage one pay for the raw agricultural commodity and c_{1i} are other stage-one production costs.

(b) Policy-Price Transmission

The hypothesis that there will not be complete pass-through to consumers of changes in policy prices is not entirely new. Colman (1988) has suggested that perfect transmission of policy prices is unlikely to occur for several reasons, e.g. the form of the policy intervention, and differences between the elasticity of supply at the farm-gate and the processing level (see Gardner). In addition, other empirical analysis suggests that slow transmission of changes in agricultural prices might have something to do with imperfectly competitive marketing intermediaries (Kinuccan and Forker). However, no analysis has focused explicitly on how imperfect competition might affect price transmission.

Having established the Nash equilibrium prices at each stage of the above vertical market system, it is straightforward to derive the extent to which consumer prices will change following trade policy reform that affects either agricultural prices or intermediaries' prices. These effects are separated out in order to allow for the possibility that policy reform may not necessarily be directed at the agricultural sector, but at downstream sectors of the food system (this is the case for trade in bananas).

Focusing first on stage two, as the product sold at this stage represents value added to the semi-processed product from the previous stage of the chain, the effect of a change in p_{1i}, which may be the result either of a change in agricultural prices or policy reform at stage one, is found by differentiating expression (7) with respect to p_{1i}, $i = 1,2$:

$$\textbf{(10)} \qquad \frac{\delta p_{2i}^{C}}{(\delta p_{1i} + \delta p_{1j})} = \frac{2b_i b_j - k^2 + b_i k}{4b_i b_j - k^2} \qquad i \neq j$$

Given the conditions stated earlier concerning the parameters b_i, b_j and k, the following can be stated about the extent of price transmission:

$$b_i b_j - k^2 = 0, \quad \delta p_{2i}^C/(\delta p_{1i} + \delta p_{1j}) = \frac{2}{3};$$
$$b_i b_j - k^2 > 0, \quad \frac{2}{3} > \delta p_{2i}^C/(\delta p_{1i} + \delta p_{1j}) > \frac{1}{2}; \qquad i \neq j$$
$$k = 0, \quad \delta p_{2i}^C/(\delta p_{1i} + \delta p_{1j}) = \frac{1}{2}.$$

Therefore, the extent of price transmission at stage two is less than complete when firms play Cournot, the extent depending on the degree of product differentiation. In particular, the more independent the products, the lower the extent of pass-through.

Price transmission at stage one, due to a change in agricultural prices, is found by differentiating (9) with respect to p_{ai}, $i = 1,2$:

$$\textbf{(11)} \qquad \frac{\delta p_{1i}^C}{(\delta p_{ai} + \delta p_{aj})} = \frac{8 b_i b_j - k^2 + 2 b_i k}{16 b_i b_j - k^2} \qquad i \neq j$$

This expression has a similar interpretation to (10) such that the following can be stated about price transmission:

$$b_i b_j - k^2 = 0, \quad \delta p_{1i}^C/(\delta p_{ai} + \delta p_{aj}) = \frac{9}{15};$$
$$b_i b_j - k^2 > 0, \quad \frac{9}{15} > \delta p_{1i}^C/(\delta p_{ai} + \delta p_{aj}) > \frac{1}{2}; \qquad i \neq j$$
$$k = 0, \quad \delta p_{1i}^C/(\delta p_{ai} + \delta p_{aj}) = \frac{1}{2}.$$

Again, as with stage two, the extent of price transmission is less than complete under Cournot, the extent depending on the degree of product differentiation.

In terms of gauging overall price transmission through this two-stage vertical chain, the following can be stated: with Cournot behavior, as a result of price changes in the agricultural

sector, if the goods are perfect substitutes, consumer prices change by only 40 percent of the farm-level price change. If the goods are independent, consumer prices will change by 25 percent. Clearly, therefore, relative to the case of perfect competition throughout the marketing system, imperfect competition, as characterized by Cournot duopoly, can have a substantial effect on how consumer welfare changes because of policy reform.

The intuition for these results is straightforward: when markets are oligopolistic, a firm's perceived elasticity of demand will vary with the nature of its beliefs about rival firms' reactions to their particular action. Thus, in the case of Cournot behavior, firms' effectively "pull their punches" in terms of output choice when input costs change, compared to perfectly competitive behavior, and these effects are then being amplified through a vertical marketing system. Product differentiation affects the results in terms of the extent to which firms are able to act more monopolistically, so that in the limit, when the goods sold at stage two are totally independent, firms simply act as monopolists.

While it is not shown here, these results are generalizable to other forms of duopolistic market structures. In particular, if firms act in a Bertrand fashion, apart from the case of independent products, price transmission is greater than under Cournot behavior, while for behavior less competitive than Cournot, price transmission is less. Also, for a given form of oligopolistic behavior, increasing the number of firms at any stage of the vertical chain will increase the extent of price transmission. In addition, if there were vertical integration between stages one and two in the system, assuming stage one output were transferred to stage two at marginal cost, then the degree of transmission through the system would increase. (Up to the mid-1980s, there was a good deal of vertical integration in the banana export industry. In

particular, United Brands owned plantations, a fleet of refrigerated vessels, and ripening facilities. However, they have now divested themselves of their transportation subsidiaries.)

3. Evaluating Reform of the EC's Banana Regime

In order to explore the significance of accounting for market structure in trade policy analysis, the welfare changes resulting from the new EC policy were derived using a calibrated version of the above model. (The technique of calibrating this type of model was originally pioneered by Dixit, 1987). Because the change in EC policy has been targeted at banana imports, the analysis only needs to focus on stage two firms who face an increase in the price of landed, unripened bananas.

In its simplest form, the non-cooperative game at stage two is assumed to be played by suppliers of ACP bananas (q_{21}) competing with suppliers of non-ACP bananas (q_{22}). Using external estimates on elasticities, the demand system associated with (4) was calibrated for the UK market where ACP suppliers (Geest and Fyffes) account for around 75 percent of total banana sales. (Note the more general, conjectural variations version of the model was used here in order to allow for firms at stage two to have non-Cournot conjectures). The elasticity of demand was assumed to be -0.4 (Islam and Subramian), and given that ACP and non-ACP banana supplies are assumed to be differentiated to some degree due to the marketing activities of firms and perceived differences in the quality of bananas, a relatively high value of the elasticity of substitution was assumed. Prices in the UK have been affected by quota restrictions on non-ACP suppliers, and have, therefore, been relatively high, the tariff-equivalent of pre-1993 restrictions being 34 percent above world market prices. With the new EC common external tariff of 20 percent, the tariff-equivalent differential should have fallen by 14 percent.

What would be the effect on consumer welfare following the more liberal policy in the UK market, and how does market structure affect the outcome? Having values of b_i and k from the calibration procedure, pass-through to UK consumers of changes in the level of banana import tariffs can be derived from equation (10). Changes in consumer welfare were then derived, the results being reported in **Table 1.**

Table 1: Price Transmission and Welfare Changes Following Changes in EC Banana Regime: Effects of Market Structure

	Degree of Pass-Through (%)		Change in Consumer Surplus ($m)	Change in Consumer Surplus as % of Competitive Case
Market Structure	p_{21}	p_{22}		
Actual Behavior[1]	0.88	0.87	51.2	0.88
Cournot Oligopoly	0.61	0.78	41.9	0.72
Perfect Competition	1.00	1.00	58.1	-

[1] Actual behavior of firms is derived from the calibration procedure, while Cournot behavior is imposed.

Ignoring imperfect competition, the degree of pass-through would be 1.00, i.e. the 14 percent fall in tariffs in the UK banana market would be fully transmitted to consumers. This would result in a US $58.1m increase in consumer surplus for consumers. However, with either actual or Cournot behavior, the degree of price transmission is less, as are the estimated changes in consumer surplus. In the case of actual behavior, the increase in consumer surplus would be 12 percent less than the competitive case, while if the market exhibited Cournot behavior, it

would be 28 percent less. Clearly, market structure issues appear to make a difference in applied policy analysis.

4. Summary and Conclusions

In this paper, the effects, on policy outcomes, of vertically-related markets where there is imperfect competition at each stage, have been explored. Most agricultural economics analysis ignores vertical market linkages when assessing the effects of agricultural policy and trade reform. However, understanding the role of vertical market linkages is clearly important when focusing on processed food markets and, perhaps more critically, appreciating the significance of imperfect competition that clearly characterizes these sectors. By ignoring such characteristics, policy analysts are likely to over-estimate the degree to which consumer prices will change, and hence, the corresponding change in consumer welfare. This was highlighted with an application to changes in the EC banana regime, a market characterized by two main sources of supply and the existence of a few multinational firms. Depending on the nature of oligopolistic behavior, it was estimated that consumer surplus changes could be as much as 28 percent lower than estimates assuming perfect competition. Consumer surplus changes could be even lower if further vertical linkages were assumed, the changes calculated here assuming only one imperfectly competitive stage.

The question that has been pursued in this paper is whether vertical markets and market structure issues matter in policy analysis? They do. Consequently, this creates an obvious agenda for future research. Only by attempting to derive a more accurate representation of agricultural markets will a better perspective of the effects of policy reform emerge.

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